CHALLENGES AND BARRIERS OF BUILDING INFORMATION MODELLING (BIM) IMPLEMENTATION IN CONSTRUCTION INDUSTRY

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I hereby declare that I have checked this project and in my opinion, this project is adequate in terms of scope and quality for the award of the Bachelor Degree of Civil Engineering

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STUDENT'S DECLARATION

I hereby declare that the work in this thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at Universiti Malaysia Pahang or any other institutions.

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To my beloved parents, Hamzah Ahmad and Rodiah Abd Majid.

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ABSTRAK

Building Information Modelling (BIM) adalah proses berasaskan model intelektual yang memberikan wawasan untuk mewujudkan dan mengurus projek bangunan dan infrastruktur dengan lebih pantas, lebih ekonomik dan kurang kesan terhadap alam sekitar. BIM ditakrifkan sebagai teknologi pemodelan dan set yang berkaitan proses untuk menghasilkan, berkomunikasi, menganalisis dan model bangunan sepanjang kitaran hayat keseluruhan projek. Walaupun terdapat manfaat yang diperoleh daripada penggunaan BIM, industri pembinaan tempatan masih enggan menggunakan teknologi dalam penyampaian perkhidmatannya. Objektif kajian ini adalah untuk mengenal pasti jenis cabaran dalam mengaplikasikan BIM di dalam sector pembinaan melalui kajian bacaan, merangka soalan soal selidik mengenai cabaran dan halangan untuk mengaplikasikan BIM dan juga mengkaji kesan cabaran kepada hasil BIM sekiranya BIM diguna pakai dalam industri pembinaan tempatan. Kajian soal selidik telah diedarkan dalam sektor pembinaan, perunding dan firma seni bina di kawasan Lembah Klang. Kaedah pengumpulan data adalah dengan menggunakan soal selidik dan juga temubual ringkas. Kesimpulan utama diambil daripada kajian ini adalah tahap yang tinggi penggunaan ICT di kalangan profesional pembinaan telah menjadikan industri yang lebih mudah dalam BIM muncul dan halangan yang dikenal pasti boleh terbatas kepada tiga kategori utama iaitu di kalangan individu, teknologi serta proses. Kesimpulan yang diambil dari kajian ini adalah kos, kekurangan dalam bekerjasama dalam sesebuah projek dan panduan permodelan serta sifat pentigkan urusan masing-masing merupakan cabaran dan halangan paling besar dalam pelaksanaan BIM dalam industri pembinaan.

ABSTRACT

Building Information Modelling (BIM) is an intelligent model-based process that provides insight for creating and managing building and infrastructure projects faster, more economically and with less environmental impact. It also represents the process of development and use of a computer generated model to simulate the planning, design, construction and operation of a facility. BIM is defined as a modelling technology and associated set of processes to produce, communicate, and analyse building models throughout the entire project's lifecycle. Although there is bound of benefits that gained from the BIM application, the local construction industry still reluctant to deploy the technology in delivery its services. The objectives of the study is to identify the types of challenges from relevant literature review related to BIM, to design the questionnaire on the challenges and barriers during the implementation of BIM and to analyse the effect of challenges to the outcome of BIM. The survey questionnaires were distributed in the construction field, consultant firm and architecture firm within Klang Valley. The method of data collection is by questionnaire and also simple interview. The main conclusion drawn from the study are cost, lack of collaborative work processes and modelling standards and fragmented nature are the most largest challenges and barriers in the implementation of BIM in construction industry.

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LIST OF ABBREVIATIONS

AEC	Architecture, Engineering, Construction
AGC	Associated General Constructors
AI	Average Index
AIA	American Institute of Architects
BAS	Building Automation System
BCSs	Biosafety Cabinets
BIM	Building Information Modelling
CAD	Computer Aided Design
CADD	Computer Aided Drafting and Design
CAM	Computer Aided Manufacturing
CIDB	Construction Industry Development Board
CMM	Capability Maturity Model
CNC	Computer Numerical Control
COBie	Construction Operations Building Information Exchange
CPM	Critical Path Method
ICT	Information and Communication Technology
IPD	Integrated Project Delivery
IT	IT Information Technology
MEP	Mechanical, Electrical, Plumbing
NBIMS	National Building Information Modelling Standards
O&M	Operation & Maintenance
PrM	Production Manager

RFID	Radio Frequency Identification
ROl	Return on Investment
2D	Two Dimensional: x,y
3D	Three Dimensional: x,y,z
4D	Four Dimensional
5D	Five Dimensional

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

Building Information Modelling (BIM) is an intelligent model-based process that provides insight for creating and managing building and infrastructure projects faster, more economically and with less environmental impact. It also represents the process of development and use of a computer generated model to simulate the planning, design, construction and operation of a facility (Arayici, 2009).

The Building Information Model is primarily a three dimensional digital representation of a building and its intrinsic characteristics. It is made of intelligent building components which includes data attributes and parametric rules for each object. For instance, a door of certain material and dimension is parametrically related and hosted by a wall. Furthermore, BIM provides consistent and coordinated views and representations of the digital model including reliable data for each view.

This saves a lot of designer's time since each view is coordinated through the built-in intelligence of the model. According to the National BIM Standard, Building Information Model is "a digital representation of physical and functional characteristics of a. facility and a shared knowledge resource for information about a facility forming a reliable basis for decisions during its lifecycle; defined as existing from earliest conception to demolition".

Construction industry is moving rapidly toward modernization. Information Communication Technology (ICT) has played the significant roles in this

transformation. The use of ICT permeates various industries and is seen as a major driver for improvement in performance and cost efficiency (Arayici, 2009).

However, the performance of ICT towards the industry is still under privileged. It might be due to the different types of software used by the participants of the industry, the amount of the redundant information and the manual transfer of information (McGraw-Hill, 2008).

To solve, this problem, Building Information Modelling (BIM) has been introduces to the industry. BIM is suitable to support the simulation of a construction project in a virtual environment, with the advantage of taking place in silico through the use of a proper software package (Jardim-Goncalves, 2010). Although the adoption of BIM is expanding within the industry and it have been beneficial to several parties. Yet, there is still some space for improvements.

Even though the concept of BIM has been widely implemented, but people still failed to explore how a BIM can really talk to a construction project in a real time manner (McGraw-Hill, 2008).

1.2 PROBLEM STATEMENT

The productivity and economic benefits of BIM to AEC industry are widely acknowledges and increasingly well understood. Further, the technology to implement BIM is readily available and rapidly maturing. Yet, the adoption of BIM is much slower than anticipated (Jung, Y., & Joo, M, 2011).

The researchers and practitioners have to develop suitable solutions to overcome these challenges and other associated risks. There are two main reasons; technical and managerial that cause BIM adoption is much slower than anticipated (Kacprzyk, Z, 2014).

The major drawback of technical and managerial challenges needs to be identify, synthesize and discuss. It is expected that the use of BIM will continue to

increase in the AEC industry. Despite that, there are some barriers when dealing with the BIM. As Datuk Seri Prof Judin Abdul Karim said "It is not a problem of knowledge and information on the usage of ICT; it is always about the cost." Although there is awareness of using the ICT but the cost of investment prohibited companies from adopting the technology. Big companies can afford ICT investment while most of the small companies find its adoption unaffordable (Kiviniemi, A, 2013).

Therefore, this research will identified the barriers when dealing with the widespread of BIM adoption which not only in the monetary term but also others related issues such as legal issues, data storage capacities, availability of real-time information and et cetera.

1.3 RESEARCH OBJECTIVES

The following is the research objectives that guide me throughout the study:

1.3.1 To identify the types of challenges from relevant literature review related to BIM.

1.3.2 To design the questionnaire on the challenges and barriers during the implementation of BIM.

1.3.3 To analyse the effect of challenges to the outcome of BIM.

1.4 SCOPE OF STUDY

This study focused on the participants of the construction industry generally consists of Consultants, Engineers and Contractors. The respondents will complete the questionnaire and give their opinions towards the challenges of Building Information Modelling (BIM) in project implementation and also project related issues. In addition, the study will focus on the construction industry, consultant firm and architecture firm located within Klang Valley area.

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